Japanese Global Warming Countermeasures

Leading Cases

Ministry of the Environment

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Japanese Global Warming Countermeasures Leading Cases

【Transparency】

① GOSAT-1, GOSAT-2：Whole-atmospheric GHG concentration observation is the *master cards* in improving transparency

② “DAICHI” ALOS 1 and 2, Largest-class Land Observing Satellite

【Mitigation】

③ Fukushima：Top-runner in the new energy society

④ Japan is advancing into the hydrogen society

⑤ Floating Offshore Wind
Turbine Generation: Achieving low cost, high efficiency, and high *durability*

⑥ *Cellulose* Nano Fiber (CNF)：Transforming biomass resources into cutting edge technology

⑦ Innovative energy saving *CCS*

【Adaptation】

⑧ Asia-Pacific Adaptation Information Platform (AP-PLAT)：
Tools for designing adapation measures

⑨ Utilizing sattelite remote sensing technologies: Developing storm surge/storm wave hazards maps in Small Island Developing States

GOSAT-1, GOSAT-2 : Whole-atmospheric GHG concentration observation is the *master card* in improving transparency

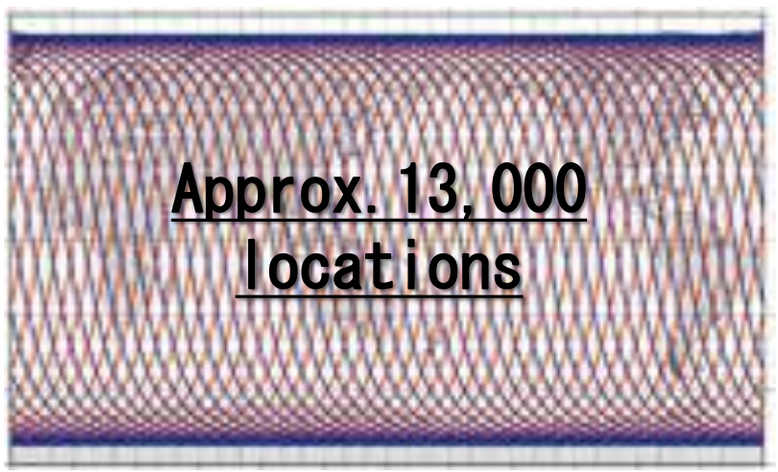
The target of GOSAT series

- ☐ **Contribution to advancement of Climate Science**
- ☐ **Contribution to Climate Policy (Promoting low carbon society)**

- ○Developed by MOEJ, Japan Aerospace Exploration Agency (JAXA), and National Institute for Environmental Studies (NIES)
- ○Current model has been operating for 8.5 years after its launch (Designed life: 5 years)
- ○Launching a succeeding model, GOSAT-2, in FY2018, and aiming to start the GOSAT-3 developing Project in FY 2018.

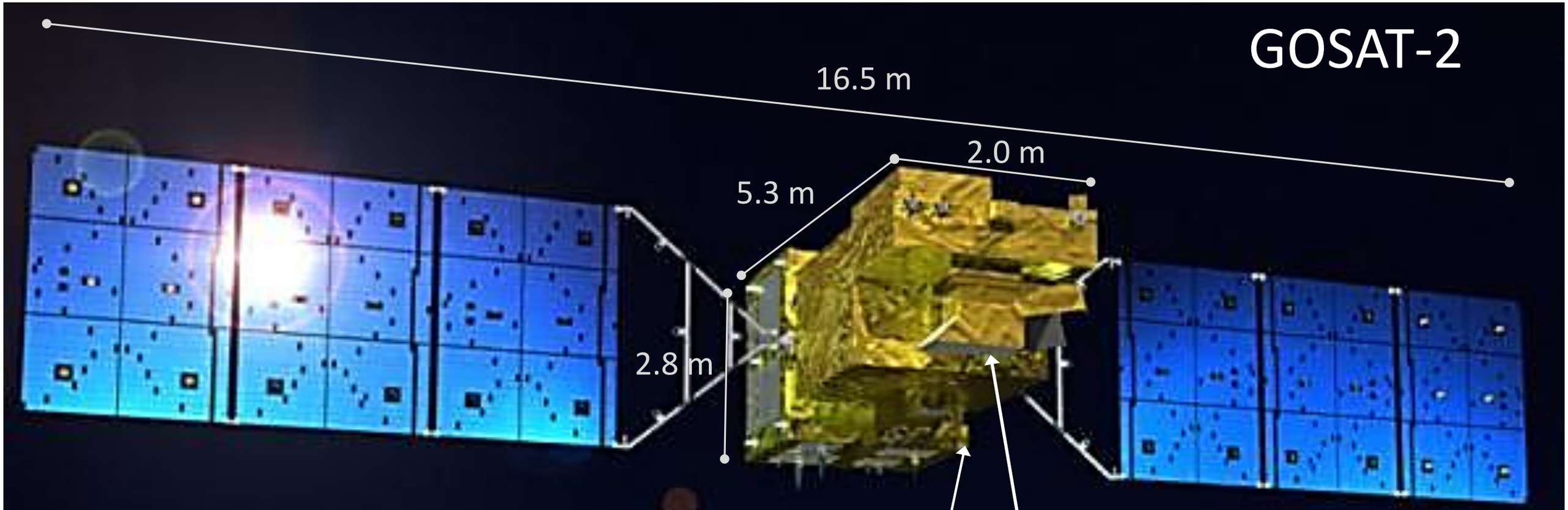
(WDCGG,2008)

Observation locations by GOSAT



GOSAT: Greenhouse gases Observing SATellite

GOSAT-2



■ GOSAT-2 Major Characteristics

- Planned launch : FY2018
- Orbital altitude : Approx. 613km
- Designed Life : 5 years
- Observation items : Major GHGs (CO2 and Methane e.t.c.), CO
- Observation quality : 500km radius, Monthly average 0.5ppm（CO2）、5ppb（Methane）

GOSAT-2 picture : ©JAXA

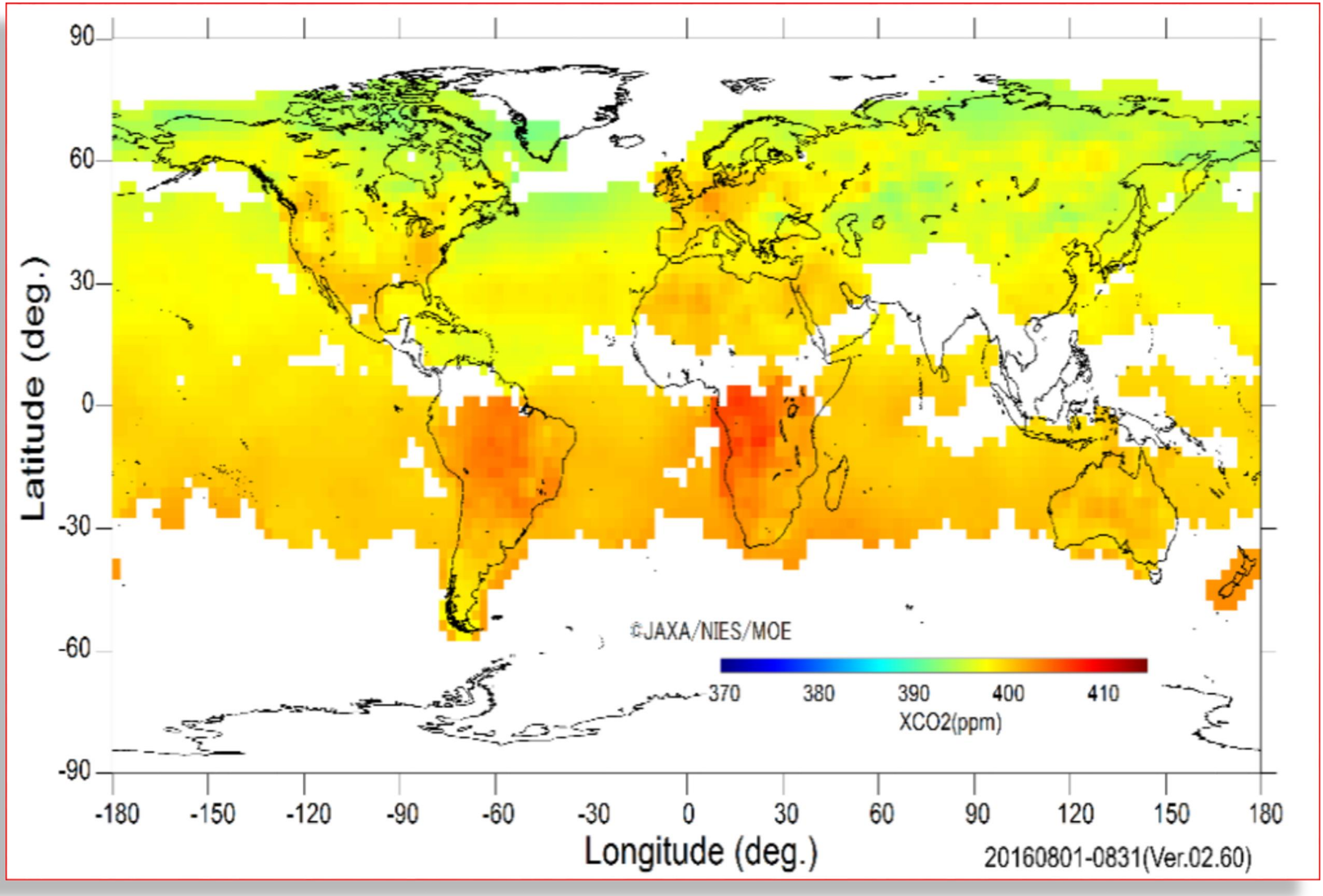
GOSAT Observation Results
Monthly Average CO_2 Concentration Distribution

	2009	2010	2011	2012	2013	2014	2015	2016	2017
Jan							※		
Feb									
Mar									
Apr	※								
May	※								
Jun						※			
Jul									
Aug									
Sep							※		
Oct									
Nov									
Dec									

370 380 390 400 410
XCO2(ppm)

※L3 product deficit

GOSAT Observation results :
CO2 monthly average distribution in Aug. 2016



DAICHI ALOS1 and 2, Largest-class Land Observing Satellite

ALOS2 Characteristics

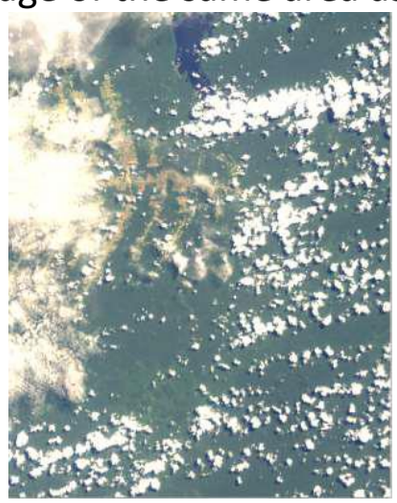
Acquire, process and provide high resolution observation data in a wide area in case of large-scale natural disaster

image resolution of 1～3m、observation range of 2,340km, provides images in 2 hours after occurrence of natural disaster at fastest

Expansion of satellite data use in various fields; Monitoring deforestation, Monitoing ice in Polar regions, Understanding land subsidence

ALOS-2 imagery of deforested areas

Optical image of the same area as above



Fukushima：Top-runner in the new energy society

Fukushima Prefecture ：Model Area for Future New Energy Society

○Appealing Fukushima’s technologies and models to the world

Expanding Renewable Energy ～Enhancing power grid network for further use～

○Fukushima Renewable Energy Institute, AIST
○Fukushima Floating Offshore Wind Turbine
○Support for Renewable energy use
○Large power grid battery experimental project
○Enhancement of power grid network in Abukuma and Futaba area

Building a Hydro Society Model
～Producing, Storing, Transporting, Using Hydrogen with renewable energy～

○Base technology researches for hydrogen energy carriers（MCH）
○Large scale hydrogen production by renewable energy（World’s biggest 10,000kW-class）
○Expansion of hydrogen use

Building a small community
～Pushing forward the reconstruction using renewable energy and hydrogen～

○Smart community building project for the reconstruction
○Establishing a CO2 free hydrogen model town
○Expanding to the whole prefecture（Conducting FS survey）

Japan is advancing into a Hydrogen society

- World's largest patent applications in Fuel-cell field, more than fivefold of the second country
- 200,000 Fuel-cells for household already installed, 40,000 fuel-cell vehicles by 2020.
- Together with a large-scale energy saving, establish a CO2 hydrogen provision system (aiming by 2040)

Energy efficiency of fuel-cells

	 Power plant	 Fuel cell
Electricity use	35%	40%
Transmission loss	5%	0%
Waste heat	60%	20%
Heat energy use	0%	40%
Overall Energy efficiency	35%	80%

Referece ; Hydrogen, Fuel-cell Roadmap

For Hydrogen Production…

Mid-term: Utilization of non-used energy

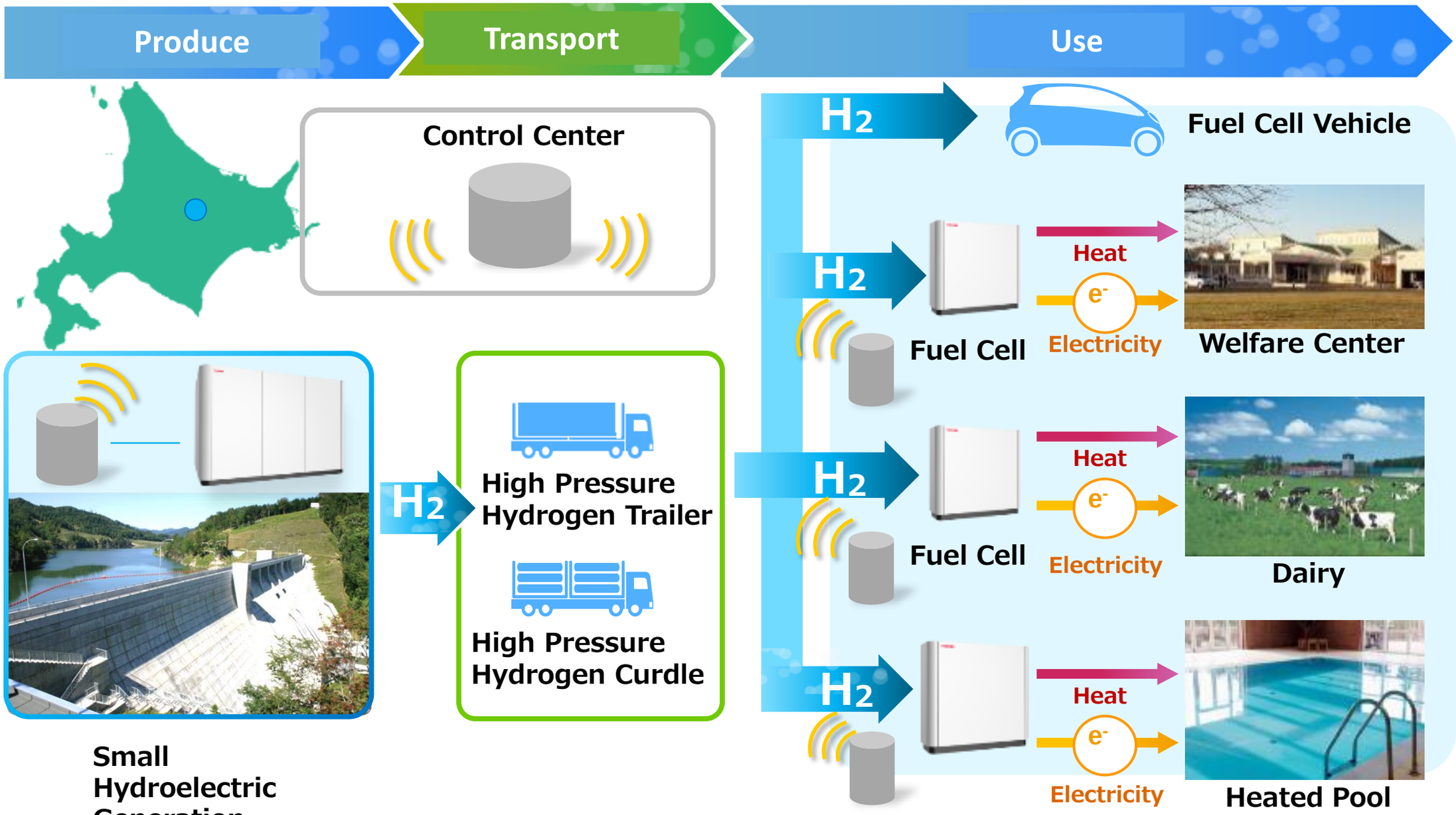
Long-term: Utilization of renewable energy

Non-used energy

Renewable Energy (Wind, Solar Power)

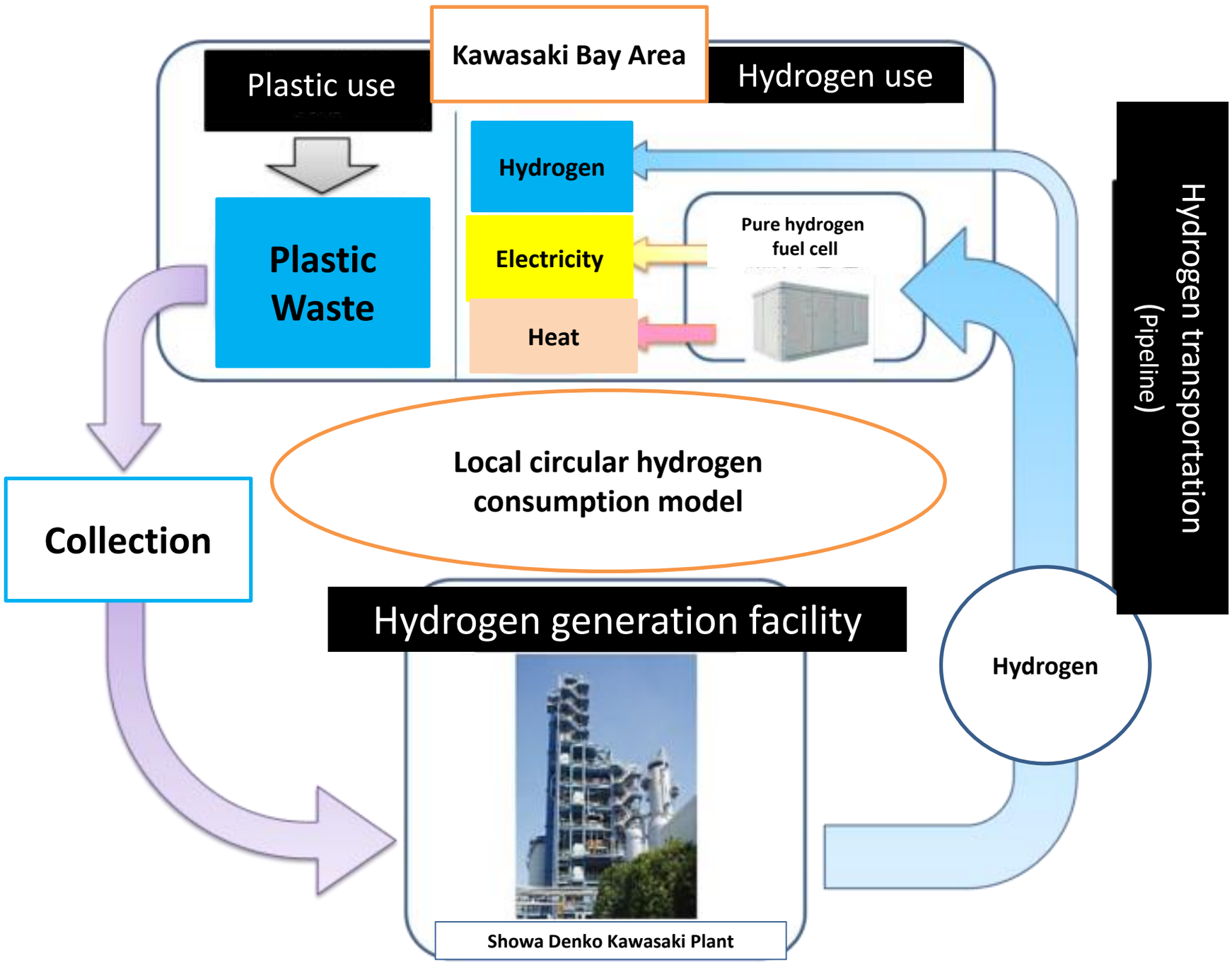
Japan is advancing into a Hydrogen society

Realize Hydrogen Production, Transportation, and Use By Utilizing Small Hydroelectric Generation



Japan is advancing into a Hydrogen society

Practical application for production, transportation, and unitization of hydrogen produced from plastic wastes by 2020



Floating Offshore Wind Turbine
Low-cost/high efficiency/high resilience

- The floating offshore wind turbine can be introduce in deep sea area around Japan (>50m).
- The demonstration project with commercial scale (２MW) has been implemented.

Low-cost/high efficiency/high resilience

■ The world first hybrid spar model

・cost has been saved by using concrete.

■ High efficient power generation

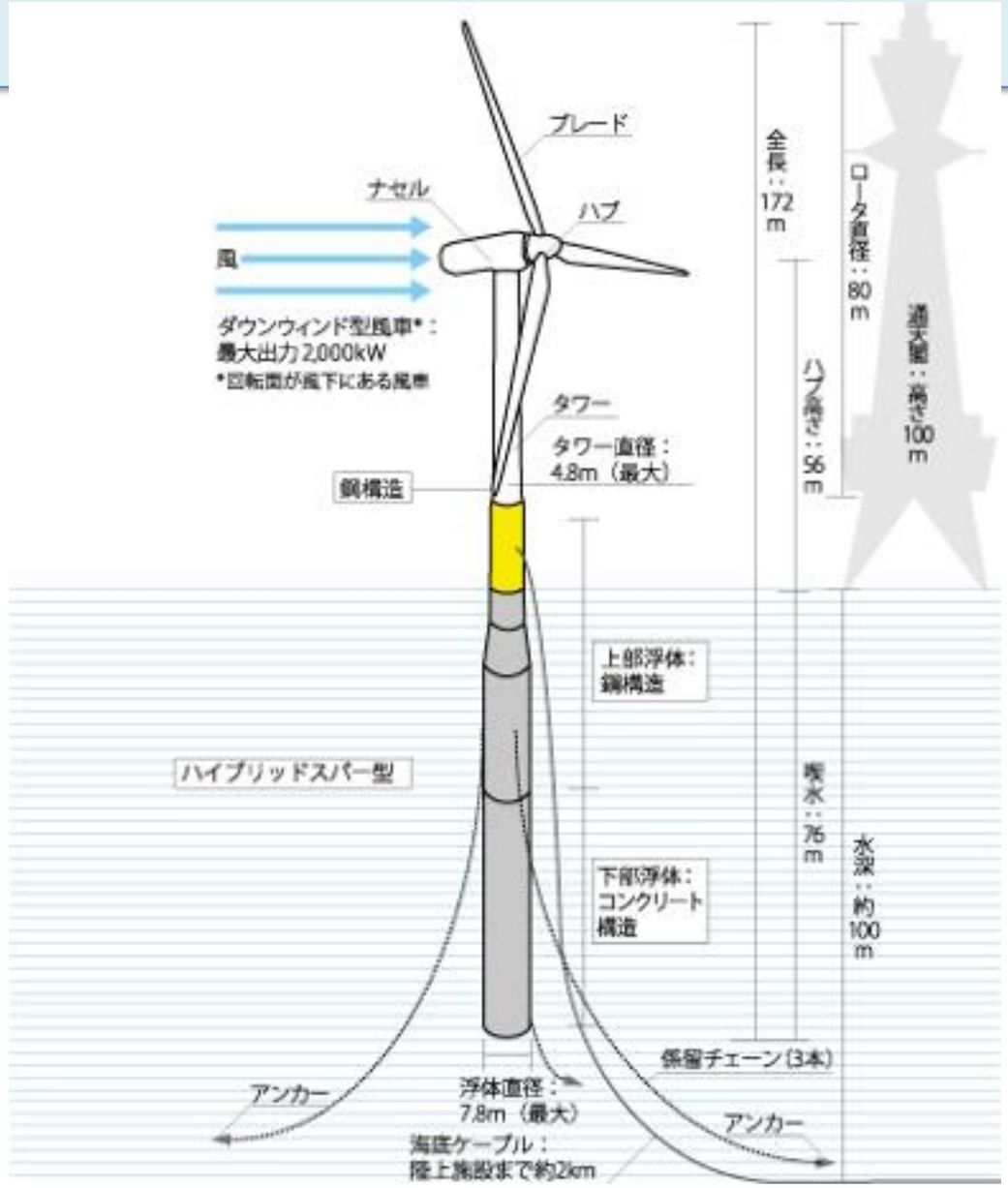
・operation ratio is over 30% (onshore is 20%)

■ High resilience

・resistance to the largest typhoon with 53m/s of wind and 17m of wave height.

■ Coordination with the fishers

・fishes have gathered around the system.



Next-generation materials

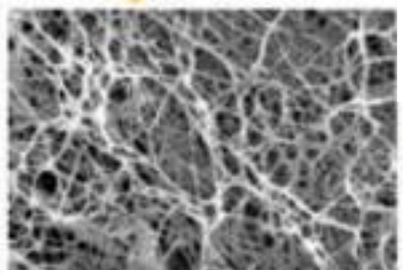
- The R&D on Cellulose Nano Fiber (CNF) and High heat Resistance plastic
- CNF is light as and five times as strong as steel.
- The next-generation materials can contribute lighter and energy efficient automobile.

Utilization of biomass resources → **Production of low-carbon CNF products** → **Utilization (use)** → **Recycle**

Realization of low carbon and sound material-cycle society by CNF

Biomass materials
(wood, etc.)

Mechanical fibrillating treatment, etc.



Nano cellulose

Becoming complex compound

Fields under research & development

High-intensity materials
(exterior of automobile/home electronics)

Highly functional materials
(building materials, interior materials, etc.)

Materials with special functions
(filter, etc.)

Transparent materials
(electronic/optical products, etc.)

Installation in the actual device

Automobile
(interior material and outside panel, etc.)

Home electronics
(fan, etc.)

House and building materials
(window frame, insulation, constructional materials)

Promoting the fields of the society, which contribute to the measures against global warming

Commercial/industrial equipment
(air-conditioning blade, etc.)

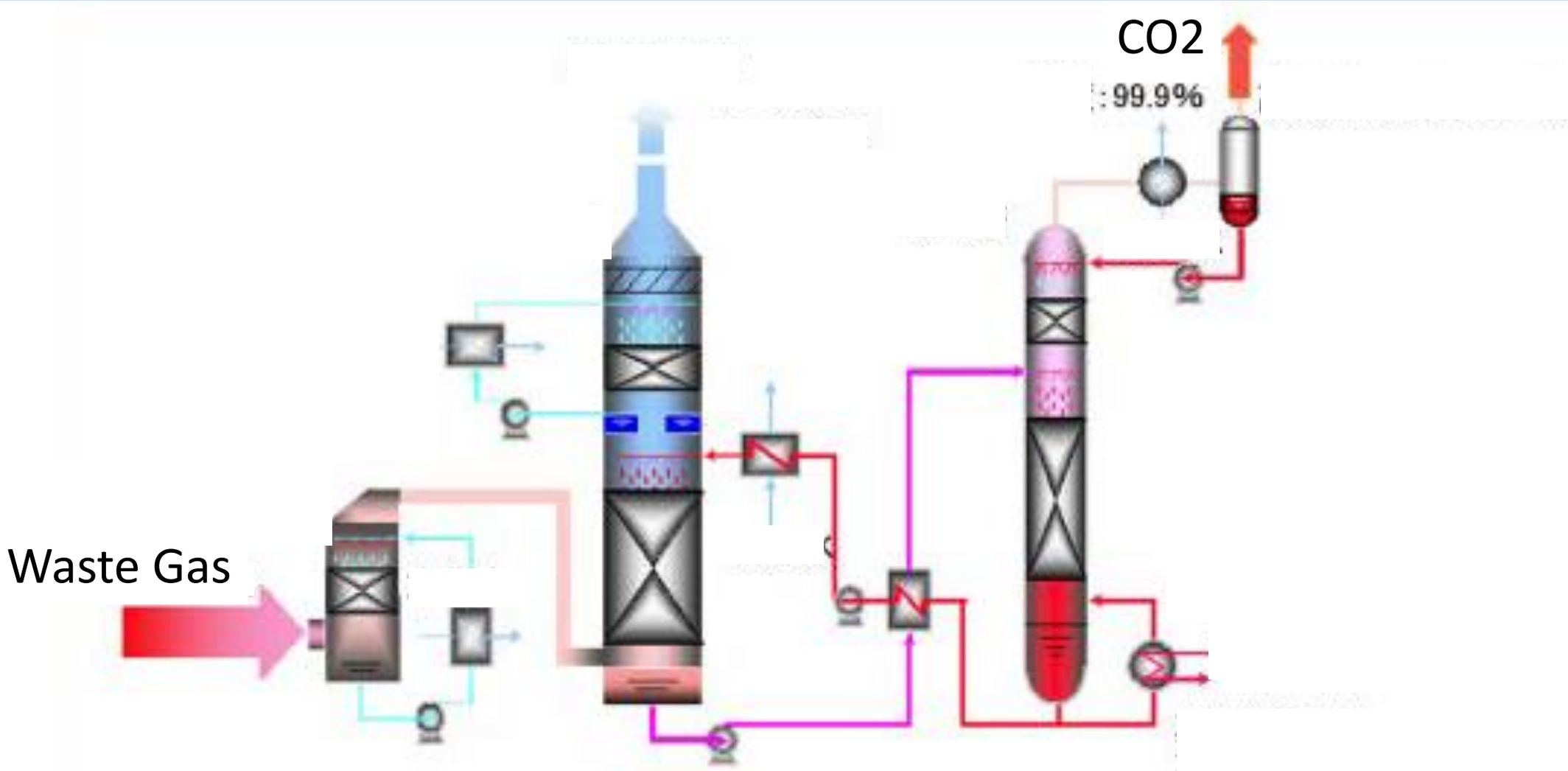
Renewable energy
(wind-power blade, etc.)

- One fifth as light as and five times as strong as steel
- Low-thermal expansion (as low as silica glass)
- Finer than the optical wavelength
- Highly recyclable
- Renewable resource
- Safe/secure natural product

(Figure: Nano Cellulose Forum)

Energy-efficient CCS

- Absorbent using Amin can capture 90% of CO2 from emission. Concentration of absorbent liquid will be 99.9%.
- This absorbent can yield high removal rate of CO2 with low pressure and low concentration, which can be applied for coal fired power plants.



「Environment」: the important index

ESG and Principles for responsible investment

- **The United Nations supported Principles for Responsible Investment (PRI) to incorporate E(Environment)・S(Social)・G(Governance) into the investment.**
- Japan has developed “Japanese version of Stewardship Code” and “Corporate Governance Code”, which introduced ESG elements.
- The world largest Government Pension Investment Fund of Japan (GPIF) joined PRI in 2015. It has selected ESG index and engaged ESG investment.
- Japanese ESG investment reached about 80 trillion yen in a year. It has been growing since the GPIF joined PRI.

Policies on ESG investment and disclosure

1 Awareness raising on ESG investment

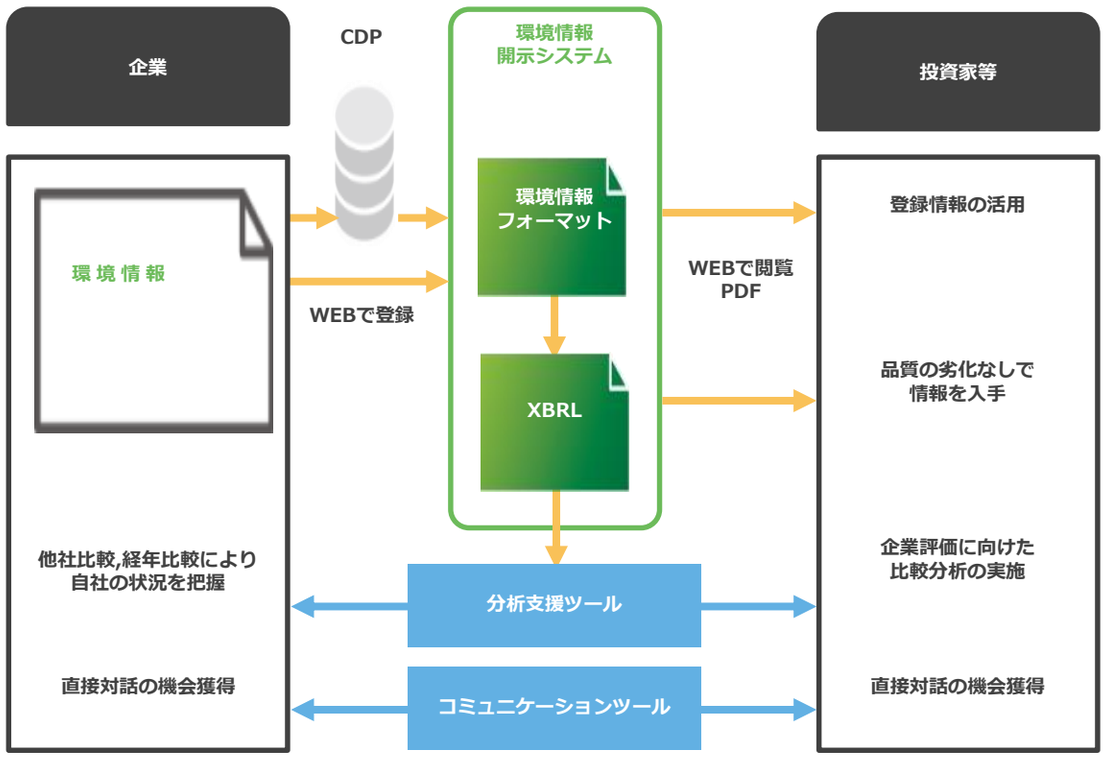
The guidance will be developed for the investors to evaluate the companies’ business strategy on environment and sustainability

2 Use of ESG information

➢The platform for disclosure of environment relevant information

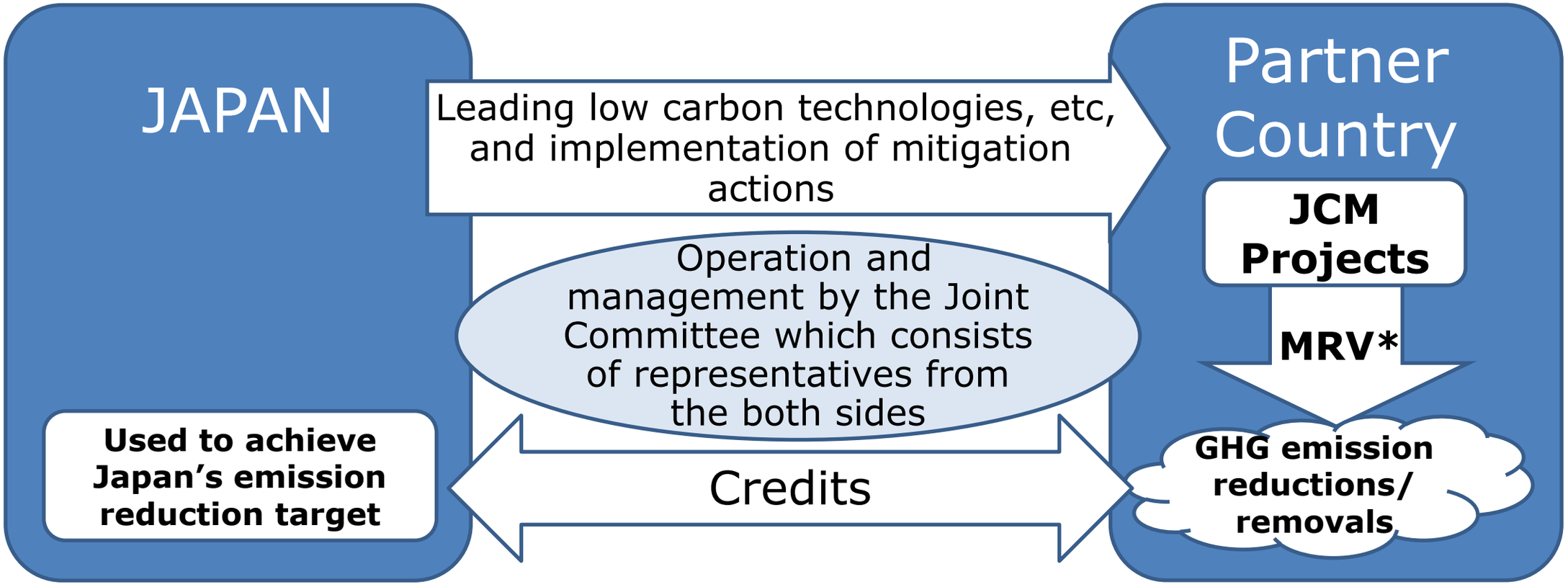
・the world first system integrating ESG information sharing, analysis and direct dialogue.

・the rule boon on disclosure of ESG information and dialogue. (700 companies have joined)



JCM: Japanese Technology Transfer scheme

- Facilitating diffusion of leading low carbon technologies, and contributing to sustainable development of developing countries.
- 17 partner countries with 122 projects in the pipeline (22 are registered projects)
- Contributing to the ultimate objective of the UNFCCC by facilitating global actions for GHG emission reductions or removals.



*measurement, reporting and verification

JCM: Transfer various low carbon technologies

Renewable Energy

PV
(Maldives)

PV
(Mongolia)

Waste to Energy
(Myanmar)

Saving Energy

Waste heat recovery in cement industry
(Indonesia)

Digital taco graph
(Vietnam)

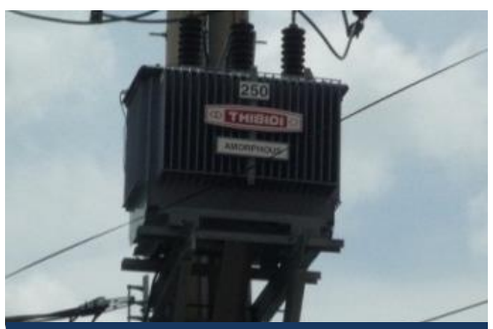
Energy saving
(Indonesia)

High Efficiency air conditioning
(Vietnam)

High efficient boilaer
(Mongolia)

Energy saving
(Thailand)

High efficient refrigerator
(Indonesia)



High efficient transfer
(Vietnam)

Co-generation systemΔ
(Indonesia)

LED control
(Cambodia)

Asia-Pacific Adaptation Information Platform:

◯ The **Platform** will be established by 2020 to share **climate risk information** via online with research institutes/universities in both developing/developed countries.

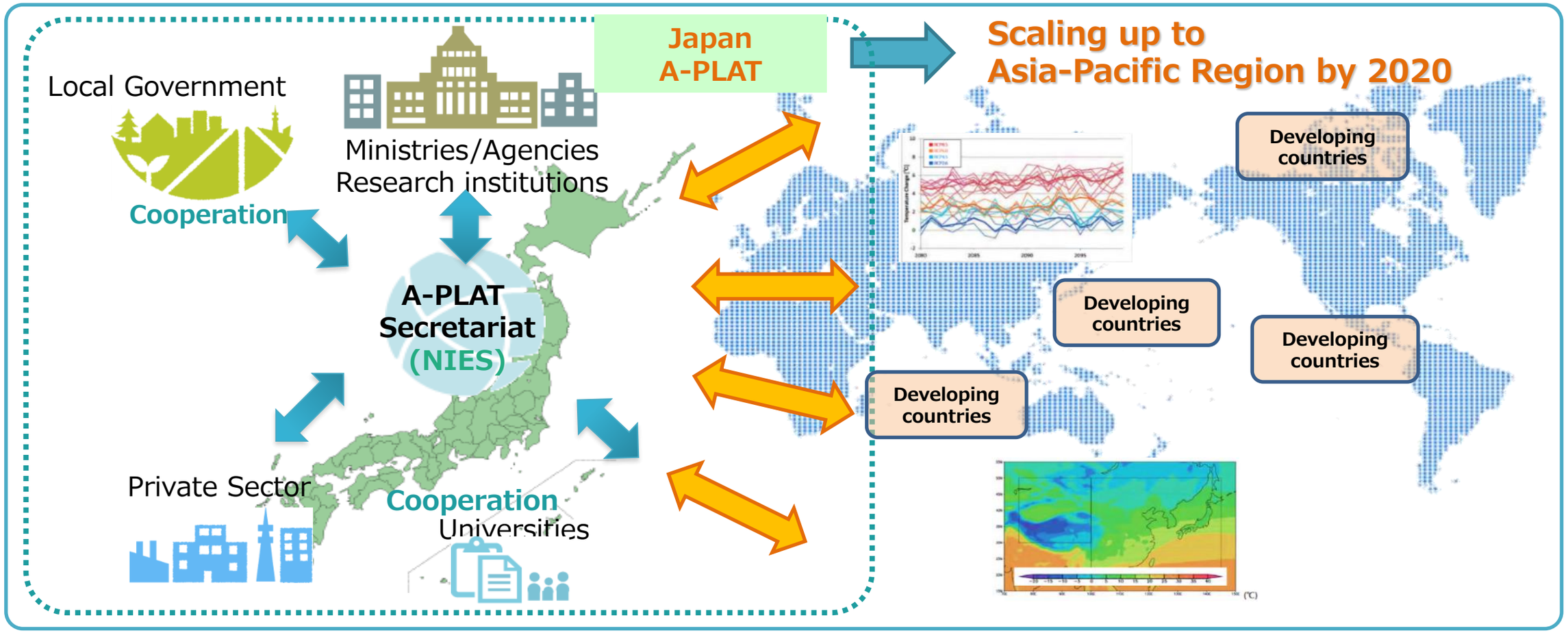
◯ To support adaptation measures by providing advanced scientific climate risk information

◯ Japan will take a lead in the following activities under the Platform

①**Develop dataset** on **projection of climate change impacts** in the region through bilateral & intensive studies

②**Develop supporting toolkits** for officials and stakeholders engaged in adaptation planning

③**Build capacity** on climate change **impact assessment/ adaptation planning**



Satellite-based remote sensing technology : 3D Hazard Map for Pacific SIDS

- Tropical cyclones causes coastal wave, surge and inundation, which is the major natural disaster in SIDS.
- Satellite-based remote sensing technology will support simulation of surge and inundation, and development of 3D hazard Map.